providing a solution in contact with the array of electrodes,

applying a potential to selected electrodes where synthesis is to occur in order to cause deblocking of the first structure,

reacting a second structure with the deblocked first structure, and

repeating the steps of deblocking and reacting another structure to form the plurality of complex structures.

98. (Amended) The method of claim 97 wherein the polymer is a synthetic polymer.

99. (Amended) The method of claim 97 wherein the polymer is a biopolymer.

106. (Amended) The method of claim 95 wherein the first structure is a chemically reactive moiety.

108. (Amended) The method of claim 95 wherein the synthesis of the complex structures occurs without mechanical movement of electrodes.

132. (Amended) The method of claim 131 wherein the sequence of the complex structures in ~~of~~ the array is determined by selective activation of electrodes adjacent a common solution.

135. (Amended) The method of claim 95 wherein the electric field causes increased local concentration of reagents at the sites where the synthesis is to occur.

136. (Amended) The method of claim 95 wherein the solution contains a sodium phosphate buffer.

143. (Amended) A method according to claim 142, wherein said buffering solution is selected from the group consisting of: tris borate buffers, sodium chloride, sodium citrate buffers, and sodium phosphate buffers.

149. (Amended) A method according to claim 142, wherein said substrate is formed from at least one material selected from silicon, glass, ceramics, silicon dioxide and plastic.

150. (Amended) A method according to claim 142, wherein said array of electrodes comprises at least 64 electrodes.

157. (Amended) A method for electronically controlled synthesis of a plurality of complex structures on a substrate, comprising the steps of:

providing a substrate having a plurality of controllable electrodes supported by the substrate and covered with a permeable layer,

providing first structures coupled to the layer, the structures having a protected functional group,

providing a solution in contact with the array of electrodes supported by the substrate,

applying a potential to selected electrodes where synthesis is to occur,

reacting a second structure with the first structure, and

repeating the step of applying a potential and reacting a subsequent structure to form the complex structures, the synthesis of the array of structures occurring without mechanical movement.

161. (Amended) The method of claim 160 wherein the polymer is a synthetic polymer.

162. (Amended) The method of claim 160 wherein the polymer is a biopolymer.

169. (Amended) The method of claim 157 wherein the first structure is a chemically reactive moiety.

173. (Amended) The method of claim 157 wherein the layer couples the first structure to the electrode.

174. (Amended) The method of claim 157 wherein the layer comprises a mesh structure.

175. (Amended) The method of claim 157 wherein the layer comprises a porous structure.